

POLYMERIZATION OF MONOMERS IN AQUEOUS
Claims.

1. A polymerization process, comprising:
polymerizing free radically (co)polymerizable monomers in the presence of a reducing agent and a polymerization medium initially comprising:
at least one transition metal catalyst; and
an atom transfer radical polymerization initiator; and
wherein the molar ratio of the transition metal catalyst to the atom transfer radical polymerization initiator is less than 0.05.
2. The polymerization process of claim 1, wherein the transition metal catalyst is in an oxidized state, and the polymerization process further comprises reacting the reducing agent with at least one of the transition metal catalyst in an oxidized state and a compound comprising a radically transferable atom or group to form a compound that does not participate significantly in control of the polymerization process.
5. The polymerization process of claim 1, wherein the concentration of transition metal catalyst in the polymerization medium is less than 1000 ppm.
6. The polymerization process of claim 1, wherein the concentration of transition metal catalyst in the polymerization medium is less than 100 ppm.
7. The polymerization process of claim 1, wherein the concentration of transition metal catalyst in the polymerization medium is less than 10 ppm.
8. The polymerization process of claim 1, wherein the polymerization medium further comprises a suspending medium.
9. The polymerization process of claim 1, wherein the reducing agent is an inorganic compound.
10. The polymerization process of claim 9, wherein the reducing agent is at least one of a transition metal compound, a sulfur compound of a low oxidation level, sodium hydrogen sulfite, an inorganic salt comprising a metal ion, hydrazine hydrate, and derivatives of such inorganic compounds.

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51. The polymerization process of claim 50, wherein the reducing agent is water soluble.
52. A polymerization process, comprising:
polymerizing free radically (co)polymerizable monomers in the presence a polymerization medium initially comprising:
at least one transition metal catalyst;
a reducing agent, and
an atom transfer radical polymerization initiator;
wherein the molar ratio of the transition metal catalyst to the atom transfer radical polymerization initiator is less than 0.25 and the reducing agent reacts with at least one of the transition metal catalyst and the compound comprising a radically transferable atom or group to form a compound that does not participate significantly in control of the polymerization process.
53. An polymerization process, wherein the reducing agent is one of an inorganic or an organic reducing agent.
54. The polymerization process of claim 53, wherein the organic reducing agent is one of at least one of alkylthiols, mercaptoethanol or carbonyl compounds that can be easily enolized, ascorbic acid, acetyl acetate, camphosulfonic acid, hydroxy acetone, reducing sugars, monosaccarides, glucose, aldehydes, or derivatives of such organic compounds.
55. The polymerization process of claim 54, wherein the organic reducing agent is ascorbic acid or a derivative of ascorbic acid.
56. The polymerization process of claim 54, wherein the atom transfer radical reaction process is one of atom transfer radical addition, atom transfer radical cyclization, atom transfer coupling, and atom transfer radical polymerization.
57. The polymerization process of claim 28, wherein the base is a ligand.
58. The polymerization process of claim 31, wherein the base is a ligand.